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SUPPLEMENT.

Public Health Reports

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No. 1.

PRÉCIS UPON THE DIAGNOSIS AND PREVENTION OF SMALLPOX.

In view of the prevalence of smallpox and the number of inquiries relating thereto, the following précis upon the subject has been prepared in this Bureau under the direction of the Surgeon-General of the United States Marine-Hospital Service, and is published with a view to distribution in States and localities where it may be of service. Smallpox is a disease easily prevented by vaccination, and the preparation of glycerinized vaccine lymph has now been brought to such perfection that there should be no fear of untoward results in its use. The prevention of the spread of smallpox is readily effected by vaccination and other measures, and is properly the care of State and local health authorities. The United States Marine-Hospital Service, upon the request of the health authorities or governor of a State or Territory, is ready to send experienced officers to determine the diagnosis when the latter is in doubt and to offer such advice as may be necessary as to the preventive measures which should be adopted. As has been the custom hitherto the Service assistance is limited as above, except under very unusual circumstances, and then only to prevent the spread of the disease from one State into another.

DEFINITION.

Smallpox is an acute contagious, infectious disease, characterized by an eruption which passes through the stages of macule, papule, vesicle, and pustule, ending in desiccation and desquamation.

ETIOLOGY.

The contagious principle, probably a microbe, has not been discovered, but it is contained in the exhalations of the skin and lungs and especially in the pustule and dried material following desiccation and desquamation, and may live for months on clothing or furniture. The contagium is tenacious, and may be conveyed by persons and by fomites, such as hair, clothing, paper, letters, furniture, etc., or it may spread through the air by means of the wind blowing the dust containing the virus. The disease is probably contagious during the first four days previous to the appearance of the eruption, but this has not been proved. A few persons seem to possess a natural immunity to the disease. No age, race, sex or climate is exempt. It attacks the fœtus in utero when the mother has the disease. It is more common among the colored races, probably on account of their condition of living in small, crowded rooms, with slight regard for cleanliness. It is worse in cold than in warm weather because of closed houses and aggregation of people.

SYMPTOMS.

True smallpox (variola vera) incubation.—The period of incubation varies from seven to twenty days, the average being twelve days. Inoculation, which might occur accidentally in obvious ways, shortens the time to seven or eight days. During this period there are usually no symptoms—sometimes a little malaise or gastric disturbance.

Invasion.—This is sudden, beginning with a chill which may be followed by others, severe aching in the “small of the back,” and sometimes the limbs; intense headache, vomiting, and fever 39.4 to 40°C. (103 to 104°F.). The pulse is rapid and strong. Convulsions may occur in children.

Eruption—Initial rash.—When this occurs it usually appears on the second day in the form of a diffused redness—the scarlatinal form—or of a macular eruption resembling measles. More rarely it may have the form of urticaria. It appears in about 13 per cent of cases (Osler), usually on the inner surface of the thighs, the lateral thoracic regions near the axilla, lower part of the abdomen, and occasionally on the extensor surfaces of the knees and elbows.

Distinctive eruption.—In the discrete or mild form small spots are seen on the third day on the forehead near the hair, around the mouth and on the wrists, and the temperature falls, which up to this time has been continuously high.

The eruption becomes general over the body in twenty-four hours, and at this stage the disease strongly resembles measles. On the fourth and fifth days of the disease the eruption is papular and the characteristic “shotty” sensation is obtained by passing the fingers over the skin. During the next twenty-four hours the papules become vesicles, with clear summits. From the sixth to the eighth day the vesicles

change to pustules with a slight depression in the center (umbilicated), each pustule being surrounded by a red border or halo. At the same time the temperature rises again, the secondary fever or *stadium supurationis* and the general symptoms return. The pustules are especially thick on the face, which is much swollen and disfigured.

About twenty-four hours before its appearance on the skin the eruption develops on the mucous membranes of the respiratory and alimentary tracts, and may be seen on the soft palate, fauces, larynx, and trachea. The inner sides of the thighs and axillary regions, the sites of the initial *rash*, are usually free from the characteristic eruption of smallpox.

Desiccation and desquamation.—After four or five days from their appearance (twelfth or thirteenth of the disease) the pustules begin to dry up. A few days later the scabs begin to fall off, first on the face and later on other parts of the body; the temperature falls to normal and convalescence begins.

Confluent form.—The initial symptoms are more intense, the eruption occurs a little earlier. The papules are discrete but the vesicles and pustules coalesce, especially on the face, hands, and feet, but usually remain discrete on the trunk. The temperature does not fall to the same degree on the appearance of the eruption as in the discrete form, and the secondary fever is higher, more prolonged, and attended by graver constitutional symptoms, such as swelling of the lymphatic glands, salivation, diarrhea, and delirium.

When death occurs it is usually in the stage of maturation, about the tenth or eleventh day. When recovery takes place, the process of desiccation and desquamation is complete in three or four weeks; sometimes it may extend to six or eight weeks.

Hemorrhagic smallpox.—This occurs in two forms:

(a) *Purpura variolosa* (black smallpox), in which the symptoms appear early and death may occur in from two to six days. Symptoms are the same, only more intense, and the eruption appears on the second or third day in the form of a diffuse hyperemic rash with punctiform hemorrhages, especially in the groins. The rash extends, the hemorrhagic spots increase in size, ecchymoses appear on the conjunctivæ, the skin may have a uniformly purplish hue and hemorrhages may occur from the eyes, nose, stomach, lungs, urethra, and uterus.

(a) The other hemorrhagic form (*variola hemorrhagica pustulosa*) progresses as in ordinary smallpox to the vesicular or pustular stage, when hemorrhages take place into the pocks or from the mucous membranes. The majority of cases in which bleeding from the mucous membranes takes place die in from seven to nine days. Hemorrhage into the pocks is frequently followed by recovery.

Varioloid.—This is the modified form of smallpox which occurs in persons who have been successfully vaccinated. It is none the less smallpox because of its modified form, and the most virulent form of smallpox may arise from exposure to varioloid.

Symptoms may be severe with temperature reaching 39.3° C. (103° F.), but usually they are mild. The eruption appears on the third or fourth day and the fever falls at once, and the patient feels comfortable. The papules are few in number, scattered, and may be limited to the face and hands. Vesiculation and suppuration take place rapidly and there is no secondary fever. The eruption does not pass through the regular stages, many of the vesicles disappearing without suppuration and scars seldom result.

Complications—Respiratory organs.—As a consequence of the eruption on the mucous membranes, laryngeal ulcerations with perichondritis and oedema of the glottis, bronchitis, lobular, and sometimes lobar pneumonia may occur.

Digestive system.—The eruption in the throat is sometimes followed by purulent otitis, parotitis, and ulceration of the pharynx. The spleen is nearly always enlarged and often the liver.

Circulatory system.—Except the slight degeneration of the muscular fiber, pathological changes in the heart are rare. Pericarditis sometimes occurs and occasionally endocarditis.

Nervous system.—Convulsions frequently occur in children, and delirium in adults which may end in fatal coma. Post-febrile insanity and occasionally epilepsy occur during convalescence. Neuritis, as in diphtheria, may affect the pharynx, or it may be multiple in the extremities. Hemiplegia and aphasia, the result of encephalitis, rarely occur.

Joints.—Arthritis, which may be suppurative, and necrosis of the bone are sometimes met with.

Skin.—Boils are frequent, acne, ecthyma, and local gangrene sometimes occur, and occasionally after desquamation a secondary eruption resembling smallpox (recurrent smallpox).

Urinary organs.—Albuminuria is not uncommon, but true nephritis is rare.

Special senses.—Catarrhal and purulent conjunctivitis is common in severe cases, leading sometimes to keratitis with ulceration, perforation, and loss of the eye. Iritis and choroiditis may also occur. Otitis media is an occasional complication from extension through the Eustachian tube.

DIAGNOSIS.

The disease must not be mistaken for measles, scarlet fever, chicken pox, impetigo contagiosa, syphilis, cerebro-spinal fever, typhus fever, or glanders. The severity of the attack, the group of symptoms, chill, backache, headache, vomiting, and high fever, 39 to 41° C. (102.2 to 105.8° F.) continuing three or four days and falling on the appearance of the eruption should excite suspicion of smallpox, especially when this disease is prevalent.

Measles.—In measles, the period of incubation is a little longer than in smallpox—about fourteen days. The stage of invasion more nearly

resembles a cold, with shivering rather than a definite chill, sneezing, redness of the eyes, running at the nose, and cough. The eruption occurs about the fourth or fifth day, and the condition of the patient is not much improved until the sixth day, when the eruption is well developed. By the fifth or sixth day at the latest the diagnosis can be made. The eruption of measles having no tendency to become vesicular and is only slightly papular.

Scarlet fever.—The period of incubation is much shorter, one to seven days—average four—and the stage of invasion is short, with high temperature and sore throat. The eruption appears early, on the second day, first on the neck and chest and spreads rapidly over the face and body, in the form of a bright red or scarlet rash, like erythema, with a slight tendency to the formation of papules. It gradually fades after two or three days. The tongue has a characteristic appearance—the “strawberry” or “raspberry” tongue, owing to the projection of the enlarged red papillæ through the coating on the tongue. Albuminuria is a common symptom.

Chicken pox—(*Varicella*).—This is more strictly a disease of children, affecting especially those under six years of age. The incubation period is rather longer than that of smallpox—ten to fifteen days. The initial symptoms are comparatively mild, with fever, vomiting, and pain in the back and legs. Sometimes convulsions occur in children. The eruption appears during the first twenty-four hours, on the back, chest, or face in the form of red papules which in a few hours become vesicles filled with a clear or turbid fluid. They are seldom umbilicated, are scattered, more superficial than the vesicles in variola, and the intervening skin is neither inflamed nor hyperemic. In three or four days the eruption dries up into scabs, which soon fall off leaving little or no scarring. Varioloid may be mistaken for this disease.

[The observation of the Marine-Hospital Bureau has been that in the majority of mistaken diagnoses with regard to smallpox the disease has been called chicken pox. Chicken pox is a contagious disease and many local health authorities require its isolation. Particularly when smallpox is prevalent, any case of supposed chicken pox should be isolated and guarded as if it were smallpox, at least until the diagnosis is proven beyond doubt.]

Impetigo contagiosa more nearly resembles chicken pox than smallpox. The eruption appears without constitutional symptoms—occasionally there are slight febrile disturbances and malaise coincident with the appearance of the eruption which is found on the face, scalp, hands, fingers, and sometimes the trunk, in the form primarily small, pin head sized vesicles or vesico papules, flat or slightly raised and rapidly enlarging into blebs of the size of a split pea, or finger nail containing clear fluid or pus. The eruption occurs in patches or groups as in herpes, the vesicles being at first discrete and usually umbilicated, but

later coalescing and as desiccation takes place forming large crusted patches.

Syphilis.—The eruption of syphilis is sometimes exactly like that of smallpox with umbilicated pustules. The history, with the absence or slight character of the fever and other constitutional symptoms, serve to make the differential diagnosis.

Cerebro spinal fever.—The temperature is usually not so high, extremely severe headache, especially in the back of the head, intolerance of light and sound, strabismus, delirium, coma, and the early appearance of stiffness with pain and contraction of the muscles of the neck and back characterize the disease.

Typhus fever.—In this disease, mental symptoms appear early, such as delirium, often maniacal, the temperature rises steadily, usually to the fifth day when it may reach 41.6° C. (106.88° F.) and the eruption appears about the third to the fifth day, first on the abdomen and chest, rapidly spreading to the extremities and face in the form of a fine irregular, dusky mottling as if beneath the skin, and distinct papular rose spots, some of which change to petechiæ from hemorrhage.

Glanders.—In glanders the eruption appears on the face and about the joints, at the same time there is ulceration, swelling, and a mucopurulent discharge from the nose. The period of incubation is short, three or four days.

VACCINATION.

The most efficient means for preventing the spread of smallpox is by vaccination. The protection, provided the virus is pure, is believed to be as complete against contagion as is that of smallpox against a second attack, though not of as long duration, but revaccination, whenever smallpox is prevalent in a community, will continue this protection indefinitely. Therefore, the first measure after isolation of a person suffering with smallpox is the immediate vaccination of all persons who have been exposed to the disease and *revaccination* in five or six days if there is no indication of the previous virus having been effective.

In order to secure pure vaccine the supply should be obtained from an accredited source, and as bovine virus only is now used the dangers which heretofore existed from arm-to-arm vaccination are eliminated. Glycerinized lymph only should be used.

The operation of vaccinating a person, although fairly well understood, may be briefly described as follows:

Usually the left arm above the middle third is selected although in some cases the wishes of the person receiving it may be consulted. The part to be vaccinated is bared and the skin rendered antiseptic by means of soap and water or alcohol, after which, if a needle or lancet is used it should first be passed through a flame or sterilized by means of alcohol, and the part scarified in one or more places; the virus is then rubbed in. Of course, it is understood that the same needle shall

be used on but one person, and if a lancet is used it should be sterilized for each case. If the vaccination has been successful it will be found that in the course of three or four days a small papule will appear, which soon after becomes vesicular, and is surrounded by a circumscribed areola; this gradually increases until the seventh or eighth day; in the meantime a crust forms which in due course falls off, leaving the characteristic scar resembling the pits of smallpox, the whole process occupying about three weeks.

Due care should be exercised to prevent the vaccination from being irritated or the "seal" from being broken and to prevent the wound from becoming infected. A vaccine shield is best for this purpose, and it is recommended that either one provided by the dealers or improvised be used, but if a vaccine shield is not used care should be taken, as above stated, to prevent the breaking of the "seal" and undue rubbing of the part by the clothing. Adhesive plaster should not be used for this purpose.

In the communities where compulsory vaccination is not required for children going to public schools it will frequently be found that a large proportion of the pupils, unless an epidemic of the disease has recently occurred, have not been vaccinated, and it is among these that smallpox is more apt to be spread.

A thorough house-to-house inspection, isolation, and vaccination will soon put a stop to the epidemic.

The truth about vaccination.—Dr. Bizzozzi, in a recent lecture delivered at Rome, recalled strikingly to his audience the success of vaccination in Germany. He said: "Germany stands alone in fulfilling in a great measure the demands of hygiene, having in consequence of the calamitous smallpox epidemic of 1870-71 enacted the law of 1874, which makes vaccination obligatory in the first year of life, and revaccination obligatory at the tenth year. What was the result? With a population of 50,000,000, having in 1871 lost 143,000 lives by smallpox, she found by her law of 1874 the mortality diminished so rapidly that to day the disease numbers only 116 victims a year. These cases moreover occur almost exclusively in towns on her frontier. If it were true that a good vaccination does not protect from smallpox, we ought to find in smallpox epidemics that the disease diffuses itself in the well vaccinated no less than in nonvaccinated countries. But it is not so. In 1870-71, during the Franco-German War, the two peoples interpenetrated each other, the German having its civil population vaccinated optionally, but its army completely vaccinated, while the French (population and army alike) were vaccinated perfunctorily. Both were attacked by smallpox. The French army numbered 23,000 deaths by it, while the German army had only 278, and in the same tent breathing the same air, the French wounded were heavily visited by the disease, while the German wounded, having been vaccinated, had not a single case."

HOUSE-TO-HOUSE INSPECTION.

When the disease becomes epidemic a house-to-house inspection is necessary to prevent the spread of smallpox, not only to discover isolated cases but to vaccinate and revaccinate all persons who have been exposed to the disease as well as those who have not previously been vaccinated within recent years (say two years). The house-to-house inspection may be advisable before the disease is known to be epidemic.

ISOLATION.

(1) Suspects: Cases of illness suspected of being smallpox or chicken pox should be isolated and kept away from others until the character of the illness is determined. This applies equally to those who have been exposed to smallpox, having a fever at the end of the period of incubation, as to those suffering from an eruption.

(2) Cases: When the character of illness is determined to be smallpox, isolation of the patient should be continued so that there will be no danger of the disease spreading from the case. Isolation is best accomplished in places specially prepared for the purpose. A hospital or lazaretto for smallpox should be located at least 2,000 feet distant from habitations, and to the ^{downward} ~~upward~~ of the prevailing winds. It is possible under the most favorable circumstances to isolate a smallpox case in a house or residence, but it is not to be recommended. Accidents usually attendant on such isolation are responsible for new foci of the disease among the adjacent residents.

(3) Provisions for treatment of cases: On removal of cases to a hospital or lazaretto, ample provision should be made for their care and treatment, and the patients should be provided with as many comforts as possible. In fact, these comforts are required by reason of the nature of the disease, and neglect of proper care will result fatally.

Cases of varioloid, or smallpox modified by vaccination, should always be treated in the same manner as the virulent type; these cases are equally as dangerous, if not more so, from a sanitary standpoint.

As soon as a case of smallpox has been removed from a house or apartment, immediate steps should be taken to prevent the spread of the disease through these agencies. A disinfection of all infected material should be done at once. Those persons who have been in direct contact with the case, or have been exposed to the infection otherwise, should be immediately vaccinated, unless they have been protected by a recent successful vaccination, or have had the disease.

Persons who have been exposed to the disease should be considered under two classes—

(1) Those who have been exposed but once to the infection and are immediately vaccinated. These should be kept under observation until there are unmistakable evidences of the success of vaccination, when they can be discharged from further surveillance.

(2) Persons who have been exposed to smallpox and several days (over four) have elapsed before vaccination. These should be kept under observation until the period of incubation has passed. The period of incubation should be considered to date from the time of vaccination. The protective effects of vaccination in these cases are of doubtful value.

Persons who have been exposed to smallpox should be kept under the observation of a physician who should inspect them at least once daily during the period of incubation. These persons are not infectious until after the initial fever appears, and then slightly so in the first forty-eight hours, that is to say, before the eruption makes its appearance on the mucous membrane and skin.

Suspects should be kept under observation. Under certain circumstances this may best be done by segregating them in observation camps or hospitals. Under other circumstances it may be done by surveillance at their residences.

Cases of smallpox under treatment should not be discharged until the process of desquamation is complete. This is variable, depending entirely on the case. A safe rule is to await the disappearance of the peculiar red specks at the bottom of the pits or scars. So long as this condition is present, desquamation is going on:

On the termination of the case in recovery, the patient should be given an antiseptic bath—1-1000 bichloride of mercury—followed by a second bath of water, and then provided with sterile clothing.

Cases dead of the disease should be encased in sheets saturated with a strong antiseptic, preferably bichloride of mercury—1-500—inclosed in a metallic casket hermetically sealed and immediately buried. Cremation is also recommended. It is needless to add, funerals, public or private, are interdicted.

DISINFECTION.

The measures to be put in practice for disinfection are the same in general as those applicable to other infectious diseases, and may be considered under the following :

- (1) Disinfection of infected premises.
- (2) Disinfection of the person and his belongings.
- (3) Disinfection of vehicles.
- (4) Disinfection of merchandise.
- (5) Disinfection of the mails.

Premises.—On the removal of a patient from a house or apartment it is always best to have the contents of the room remain in situ while a preliminary disinfection is given. The object of this is to reduce the danger in handling the infected articles preliminary to their final and complete disinfection.

Room and contents.—This may be accomplished by one of the following methods :

- (1) By formaldehyd gas in not less than (a) 4 per cent strength for not less than six hours; (b) by exposure to sulphur dioxide for twenty-

four hours, 4 pounds of sulphur to each 1,000 cubic feet, plus due allowance made for waste.

At the end of the time specified, the apartment and its contents should be arranged for a final disinfection. (a) The room should be made as air tight as possible. (b) Clothing, bedding (exclusive of pillows and mattresses), hangings, and carpets should be so arranged as to permit all surfaces to be freely exposed to the action of the gas, and then exposed to either (1) formaldehyd gas in not less than a 4 per cent per volume strength, for not less than twelve hours, or by (2) sulphur dioxide for twenty-four hours by burning not less than 4 pounds of sulphur to each 1,000 cubic feet, plus due allowance made for waste.

Disinfection of a room can be also performed by wetting the walls, ceiling and floor with an efficient germicidal solution.

It is impracticable to thoroughly disinfect feather pillows and feather beds by either formaldehyd or sulphur dioxide. It is recommended that where there is no apparatus for disinfecting fabrics, etc., these should be destroyed by burning. Where it is practicable to do so it is recommended that clothing, bedding, carpets, articles of furniture and the like be disinfected by—

(a) Exposure to steam at a temperature of 100 to 102° C. for thirty minutes.

(b) Boiling, the articles to be completely submerged.

(c) Saturation with an efficient germicidal solution.

(d) By thoroughly wetting the surfaces of the article with a 40 per cent aqueous solution of formaldehyd, and confining it in a small closed space for not less than twelve hours (applicable for upholstered furniture). The commercial preparations known as formol, formalin, formalose, are 40 per cent solutions of formaldehyd.

(e) The application of formaldehyd gas in a special apparatus for this purpose.

Disinfection of a person and his belongings.—As previously referred to under the head of isolation, cases recovered from smallpox should be given a bath with an efficient germicide.

Clothing, bedding, and articles used in the care and treatment of the sick should invariably be disinfected in the manner as outlined, or be destroyed by fire.

The dejecta of smallpox patients should be disinfected by bichloride of mercury solution 1-500, carbolic acid solution 1-40, trikresol in solution 1-100, solution of chlorinated lime, or milk of lime.

Infected articles should never be thrown from railway coaches in transit or otherwise, nor should any article of this character be thrown overboard from vessels.

Disinfection of vehicles infected with smallpox should be performed after the following method:

Railway coaches.—For the day coach, dining car, tourist sleeper, parlor car, formaldehyd gas, applied by means of an autoclave in a 4

per cent per volume strength, the time of exposure not less than twelve hours.

For Pullman, Wagner, and other sleeping cars.—Formaldehyd gas, applied by means of an autoclave at a 4 per cent per volume strength, the time of exposure not less than 12 hours.

Arrangements of the day coach for disinfection.—All openings of the car should be closed as tightly as possible, especially the ventilators; these are best closed by means of waste. All carpets along the aisles should be laid across the top of the seats. If the car is provided with sash curtains they should be pulled down and hooked over the windows. The curtains of the seats should be shoved slightly away from the backs so that all the surface can be reached by the gas.

Water-closets, lockers, and storeroom should be opened. All apertures to be closed with waste or some other similar material. The gas should be introduced into the car by one of two ways: By the keyhole in the car door or through the hopper of the water-closet. If the car is badly infected it is always best to give a preliminary disinfection before doing all that has been outlined above. Under these conditions the car is left just as it is, apertures closed, and a strong percentage of gas thrown in and allowed to remain for at least six to eight hours before it is arranged for the final disinfection. This procedure will be sufficient to sterilize the contents and surfaces of the car, and renders this arrangement less dangerous to the operator.

The immigration coach.—If the coach is constructed with a view to easy cleansing, the interior can be given a cleaning with formaldehyd gas in not less than 2 per cent per volume strength, or by sulphur dioxide for 24 hours, by burning 4 pounds of sulphur to each 1,000 cubic feet, and after this a mechanical cleansing of the floors and water-closets, to be followed by a thorough douching with a strong disinfecting solution, preferably a solution of bichloride of mercury.

Sleeping cars.—The same general rules apply to these as for the day and immigration coach. The berths must be let down, all pillows taken out from under the seats; the mattresses and pillows so arranged that all surfaces may be thoroughly exposed, curtains suspended from the curtain poles; the carpets removed from their fastenings and placed over the backs of the seats or suspended by some means in the aisle. The lockers, closets, etc., to be opened. All the articles therein to be arranged so as to be exposed to the gas. Articles of food, not hermetically sealed, should, after the completion of the disinfection, that is, after the exposure of the goods, be destroyed.

In most cases it may be necessary to neutralize the formaldehyd gas by ammonia. This can be readily done by sprinkling a sufficient quantity on the floor of the car and allowing it to remain about one hour; about twice the quantity of ammonia should be used for the formaldehyd solution.

Sulphur is not recommended on account of the destructive effect upon fabrics.

Disinfection of merchandise.—As a rule, new merchandise is seldom, if ever infected, and if so, only the exterior. A surface disinfection is all that is required. The best method is to place the merchandise in a closed space and arranged in such a manner as to allow the free exposure of all the surfaces to the action of the disinfectant and then apply formaldehyd in not less than a 4 per cent per volume strength for not less than six hours or by sulphur dioxide for twenty-four hours by burning 4 pounds of sulphur to each 1,000 cubic feet.

Disinfection of mails.—(1) By formaldehyd gas in a 40 per cent solution, (formalin, formol, or formalose) letters to be placed in closed receptacle, provided with a tight fitting lid, and sprinkling each layer of letters with the solution. The receptacle should then be closed four hours.

(2) By the application of formalin mixed with some inert substance such as sawdust or infusorial earth. This mixture to be sprinkled over the letters in a manner similar to that prescribed in the foregoing. The time of exposure to be not less than four hours.

(3) By application of formaldehyd gas evolved from its solutions, by means of an autoclave, the exposure not to be less than four hours; or the application of formaldehyd by means of a special apparatus provided with means of producing a vacuum. These latter are better adapted where there is a large quantity of mail to be disinfected.

Individual letters can be quickly disinfected by means of a small piece of absorbent paper, moistened with formalin and inserted into the letter.

It is understood that in any of the foregoing methods, letters, etc., should not be put up in packages; newspapers and packages should be opened and spread apart before disinfection.

When it is impracticable to obtain solutions of formaldehyd, mail should be disinfected by exposure to sulphur dioxide in a closed space, made by burning 4 pounds of sulphur to each 1,000 feet of space, the exposure to be not less than twelve hours.

The following extracts are taken from the Interstate Quarantine Regulations, promulgated by the Secretary of the Treasury September 27, 1894, in accordance with the act of Congress approved February 15, 1893:

Interstate quarantine regulations.

ARTICLE I.—QUARANTINABLE DISEASES.

(1) For the purposes of these regulations the quarantinable diseases are cholera (cholerine), yellow fever, smallpox, typhus fever, leprosy, and plague.

ARTICLE II.—NOTIFICATION.

(1) State and municipal health officers should immediately notify the Supervising Surgeon-General of the U. S. Marine-Hospital Service by telegraph or by letter of the existence of any of the above-mentioned quarantinable diseases in their respective states or localities.

ARTICLE III.—GENERAL REGULATIONS.

(1) Persons suffering from a quarantinable disease shall be isolated until no longer capable of transmitting the disease to others. Persons exposed to the infection of a quarantinable disease shall be isolated, under observation, for such a period of time as may be necessary to demonstrate their freedom from the disease.

All articles pertaining to such persons, liable to convey infection, shall be disinfected as hereinafter provided.

(2) The apartments occupied by persons suffering from quarantinable disease, and adjoining apartments when deemed infected, together with articles therein, shall be disinfected upon the termination of the disease.

(3) Communication shall not be held with the above-named persons and apartments, except under the direction of a duly qualified officer.

(4) All cases of quarantinable disease, and all cases suspected of belonging to this class, shall be at once reported by the physician in attendance to the proper authorities.

(5) No common carrier shall accept for transportation any person suffering with a quarantinable disease, nor any infected article of clothing, bedding, or personal property.

The body of any person who has died of a quarantinable disease shall not be transported save in hermetically sealed coffins, and by the order of the State or local health officer.

(6) In the event of the prevalence of smallpox, all persons exposed to the infection, who are not protected by vaccination or a previous attack of the disease, shall be at once vaccinated or isolated for a period of fourteen days.

* * * * *

ARTICLE V.—DISINFECTION—FOR SMALLPOX.

Apartments infected by smallpox shall be disinfected by one or both of the following methods:

(a) Exposure to sulphur dioxide for twenty-four to forty-eight hours.

(b) Washing with a solution of bichloride of mercury 1-1000, or a 5 per cent solution of pure carbolic acid.

Clothing, bedding, and articles of furniture exposed to the infection of smallpox shall be disinfected by one or more of the following methods:

(a) Exposure to sulphur dioxide for twenty-four to forty-eight hours.

(b) Immersion in a solution of bichloride of mercury 1-1000, or 5 per cent solution of pure carbolic acid.

(c) Exposure to steam at a temperature of 100 to 102° C. for thirty minutes after such temperature is reached.

(d) Boiling for fifteen minutes, the articles to be completely submerged.

[NOTE.—Formaldehyd gas may be used when applicable.]